



New Alternative Fuel Vehicle Emissions Data

Kenneth J. Kelly



National Renewable Energy Laboratory
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CENTER FOR TRANSPORTATION TECHNOLOGIES AND SYSTEMS

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Outline

- NREL Emissions Testing Program
- Detailed Study Vehicles
- Test Matrix
- Test Cycles
- Results
- Conclusions
- Direction



NREL Alternative Fuel Vehicle Emissions Test Program

- Light-Duty Vehicle Evaluation Team
- Purpose: To provide a high-quality, objective evaluation of in-use emissions from commercially available alternative fuel vehicles



Test Status

- Tests completed (approximately)
 - 1500 FTP tests on 500 vehicles
 - 600 IM240 tests on 300 vehicles
 - 200 detailed hydrocarbon speciations on 70 vehicles
- Fuels tested: M85, M50, E85, E50, CNG, LPG, RFG
(Note: RFG = California Phase II Certification Gasoline)



Test Status (continued)

- Vehicles tested
 - OEM
 - Methanol FFV: Dodge Spirit, Ford Econoline, Dodge Intrepid
 - Ethanol FFV: Chevrolet Lumina, Ford Taurus
 - Dedicated CNG: Dodge B250 Van, Dodge Caravan
 - Standard gasoline: all of the above models
 - QVM
 - Bi-fuel CNG: Ford F150 Pickup, Ford Contour
 - Bi-fuel LPG: Ford F150 Pickup
 - Aftermarket conversions
 - Bifuel CNG: various models
 - Bifuel LPG: various models



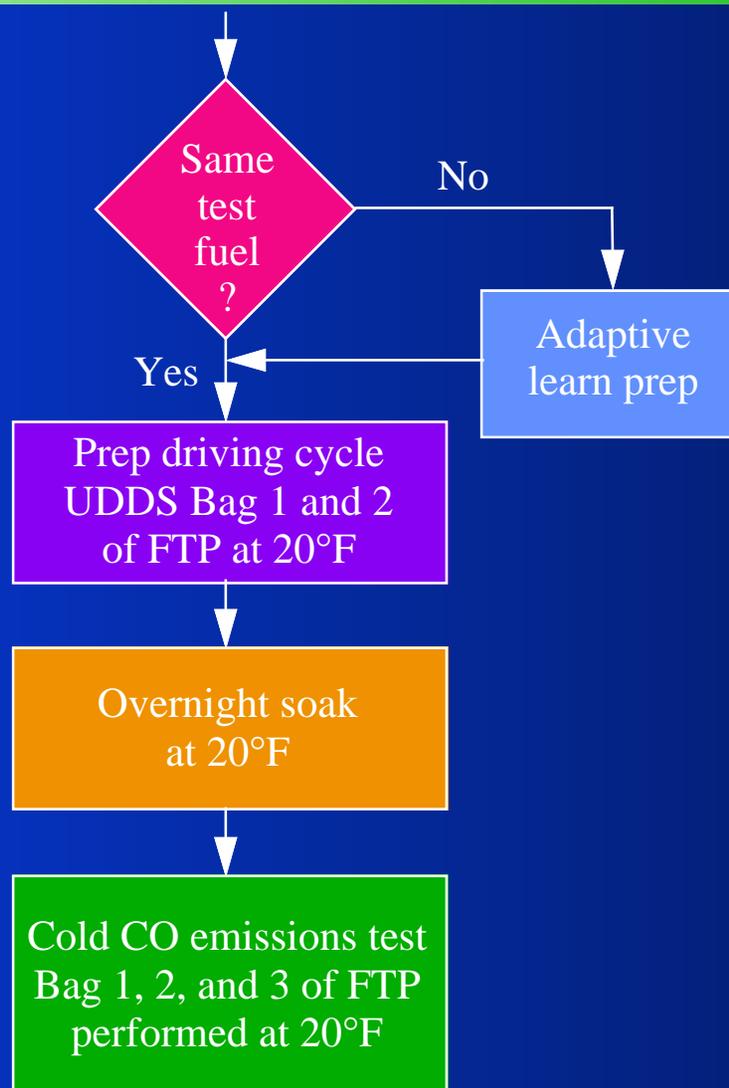
Detailed Study Vehicles

- Purpose: Detailed study to investigate emissions impacts of alternative fuels under real-world driving conditions (outside the FTP-75 test procedures)
- Approach:
 - FTP-75 with detailed hydrocarbon speciation
 - Emissions testing according to Federal Cold CO test procedures
 - Emissions testing according to the US06 “Aggressive Driving Cycle” procedures

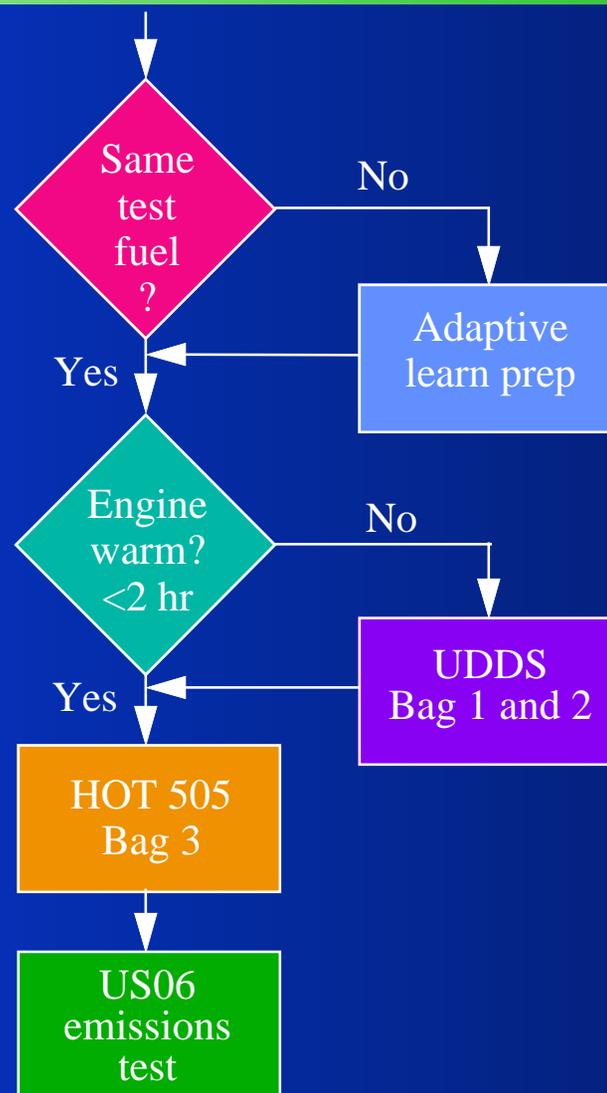
Detailed Study Vehicle Test Matrix

Make	Model	Model Year	Vehicle Type	Test Fuel	Test Vehicles	Repeats	Total Tests
Methanol FFV							
Dodge	Intrepid	1995	FFV	M85	4	1	5
				RFG	4	1	5
Dodge	Intrepid	1995	Standard	RFG	4	1	5
Ford	Taurus	1995	FFV	M85	4	1	5
				RFG	4	1	5
Ford	Taurus	1995	Standard	RFG	4	1	5
Ethanol FFV							
Ford	Taurus	1995	FFV	E85	4	1	5
Dedicated CNG							
Dodge	B250 Van	1994	Dedicated	CNG	4	1	5
Dodge	B250 Van	1994	Standard	RFG	4	1	5
Bi-Fuel CNG							
Ford	Contour	1996	QVM	CNG	4	1	5
				RFG	4	1	5
Ford	F150 Pickup	1996	QVM	CNG	4	1	5
				RFG	4	1	5
Totals					52	13	65

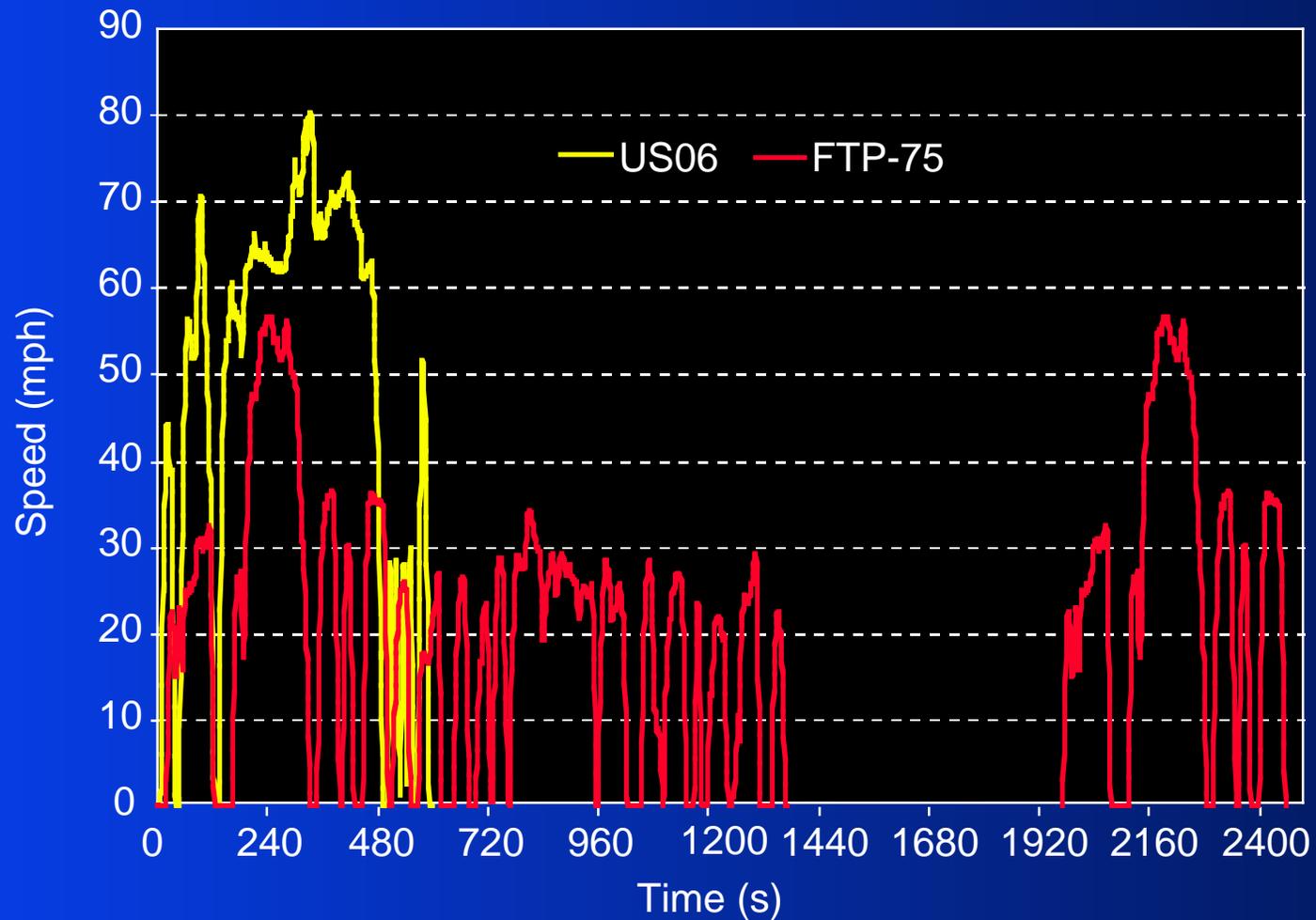
Cold CO Test Procedure



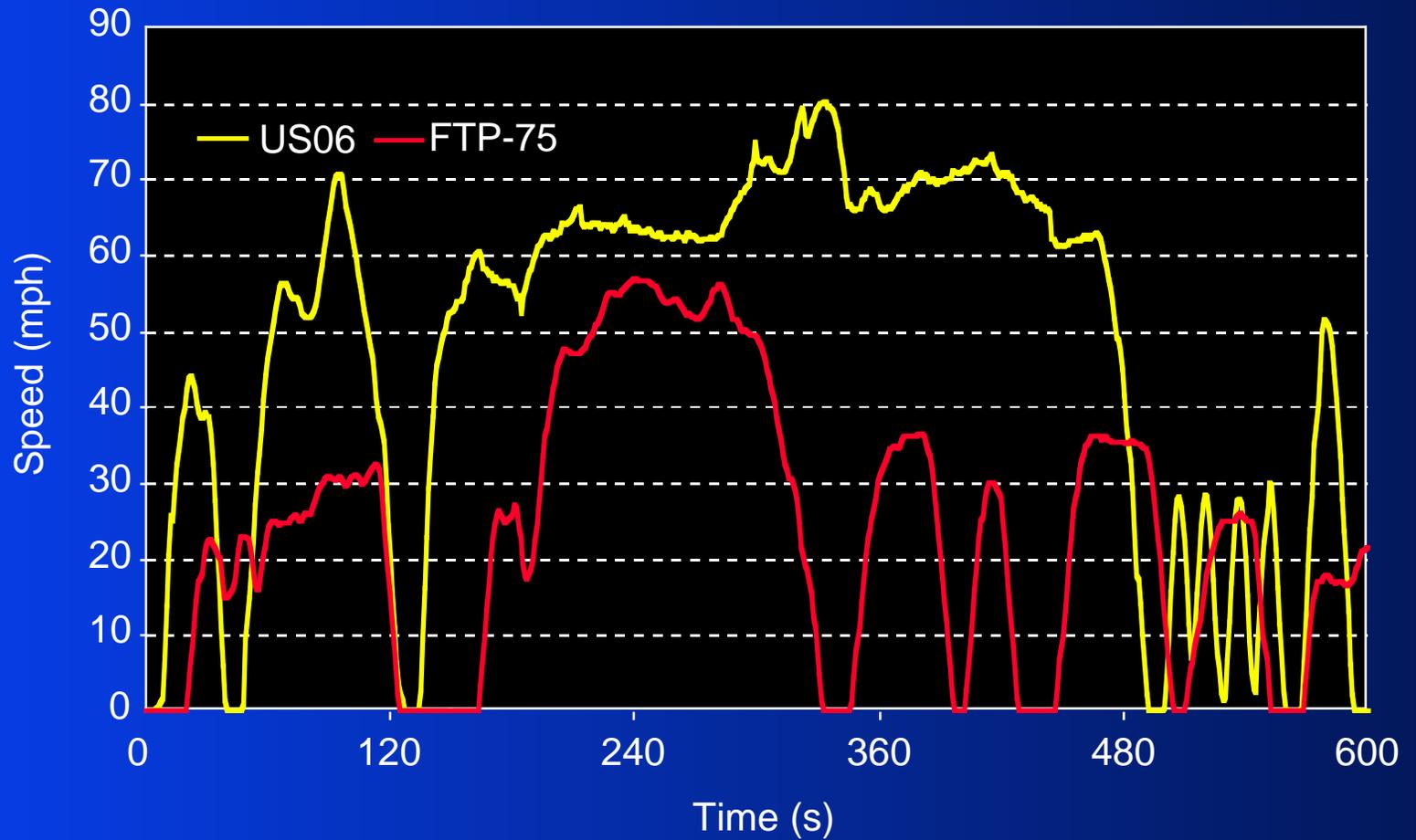
US06 Test Procedure



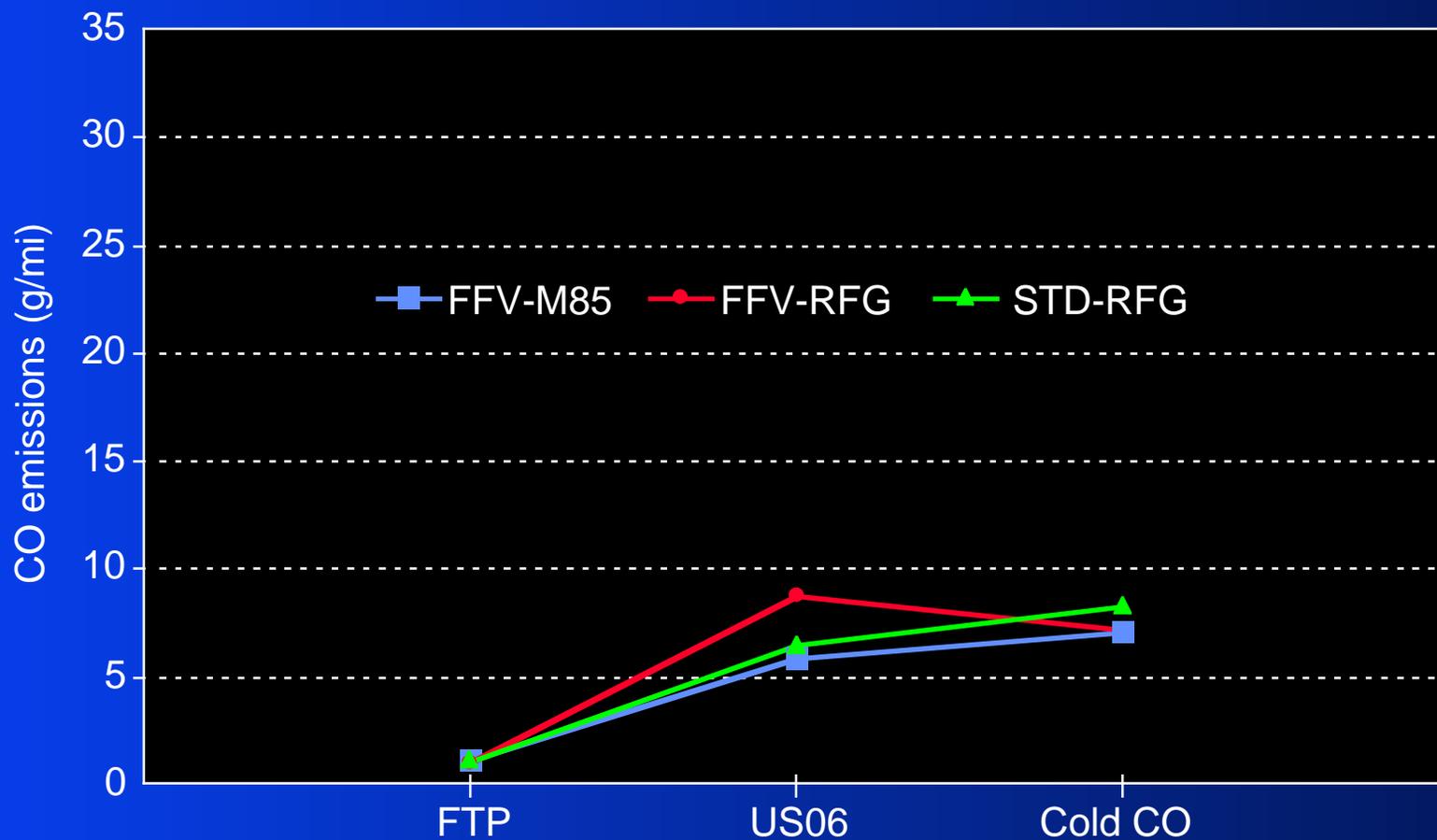
US06 Aggressive Driving and FTP-75 Driving Cycles



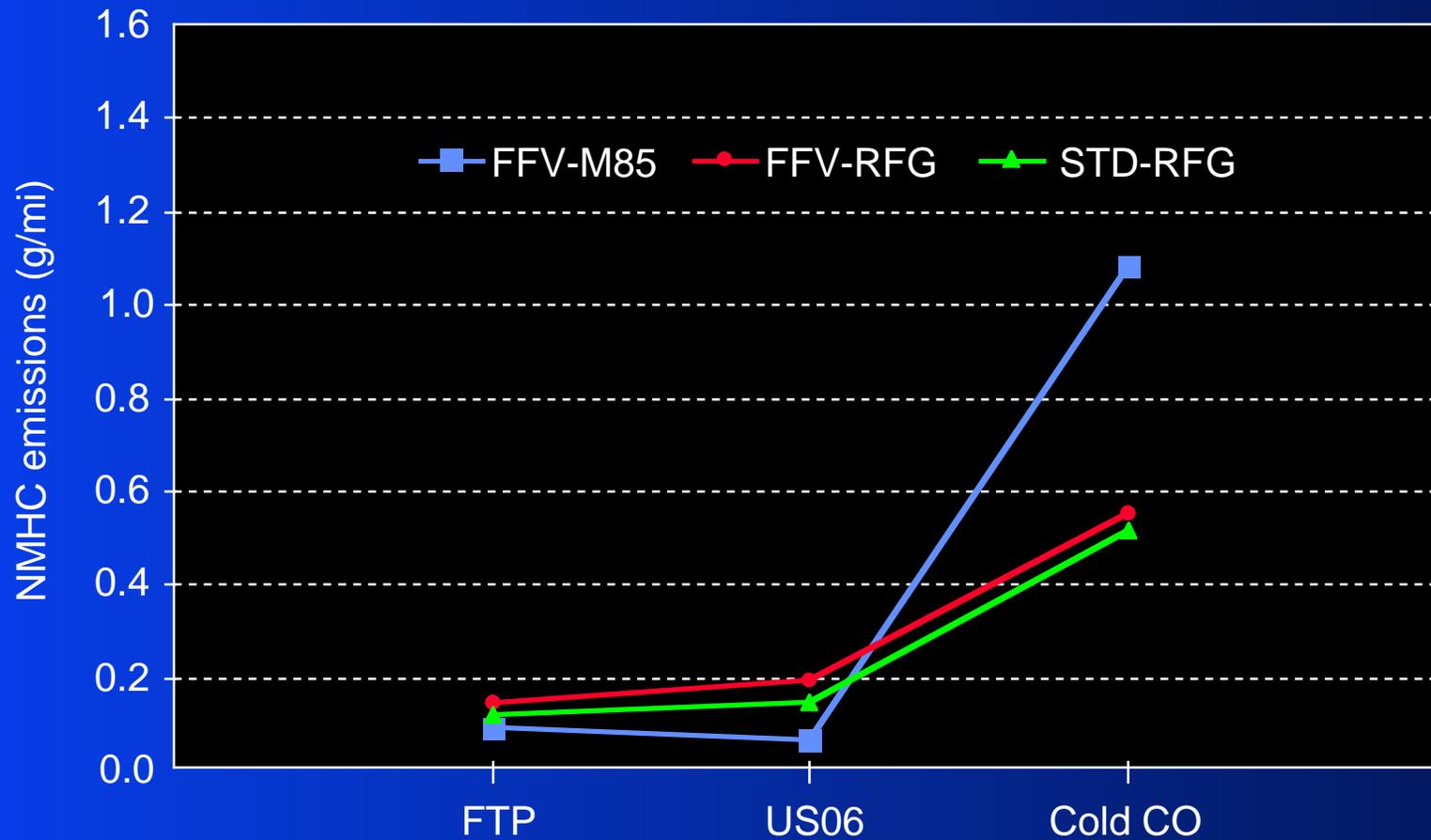
US06 and 600 Seconds of FTP-75



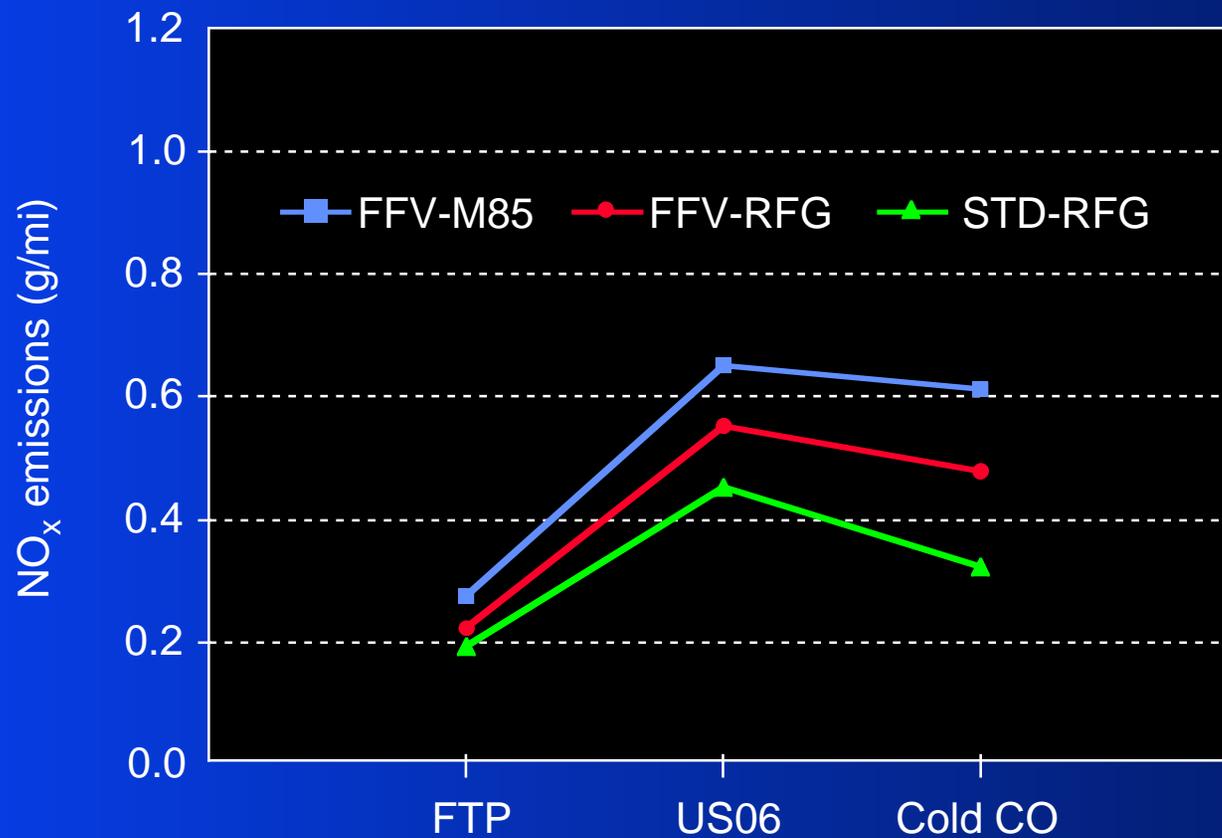
Dodge Intrepid—Carbon Monoxide



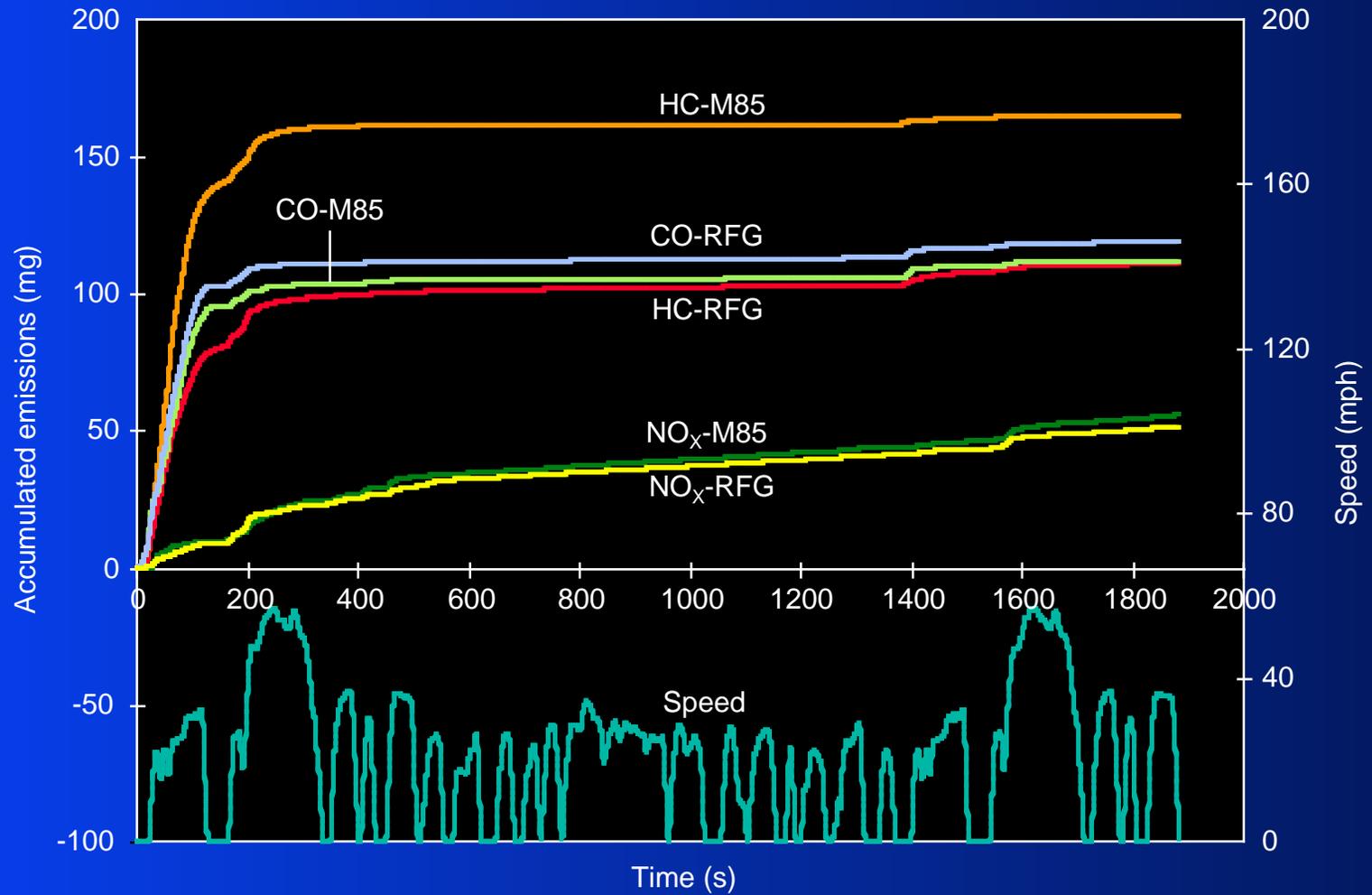
Dodge Intrepid—Non-Methane Hydrocarbon Equivalent



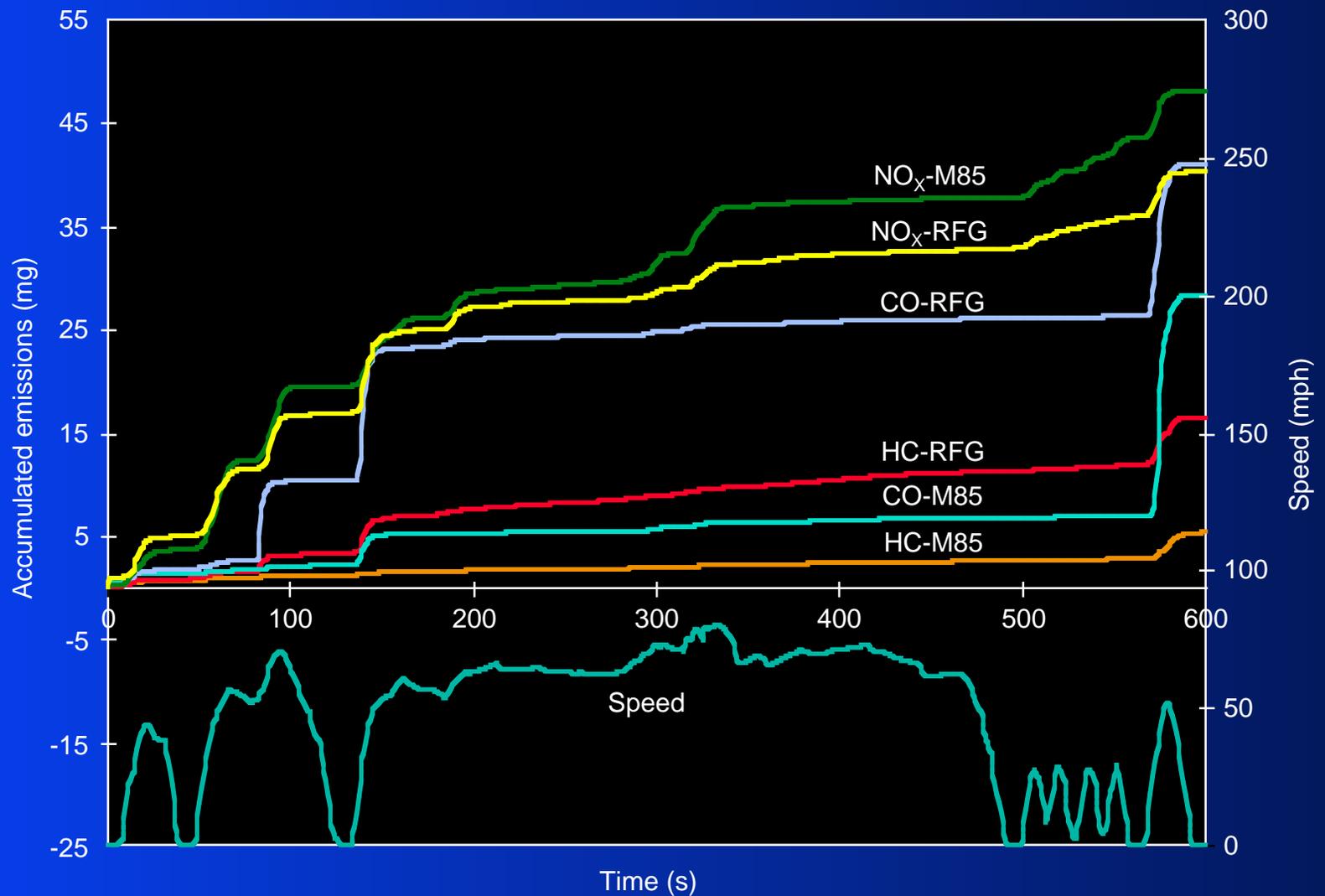
Dodge Intrepid—Oxides of Nitrogen



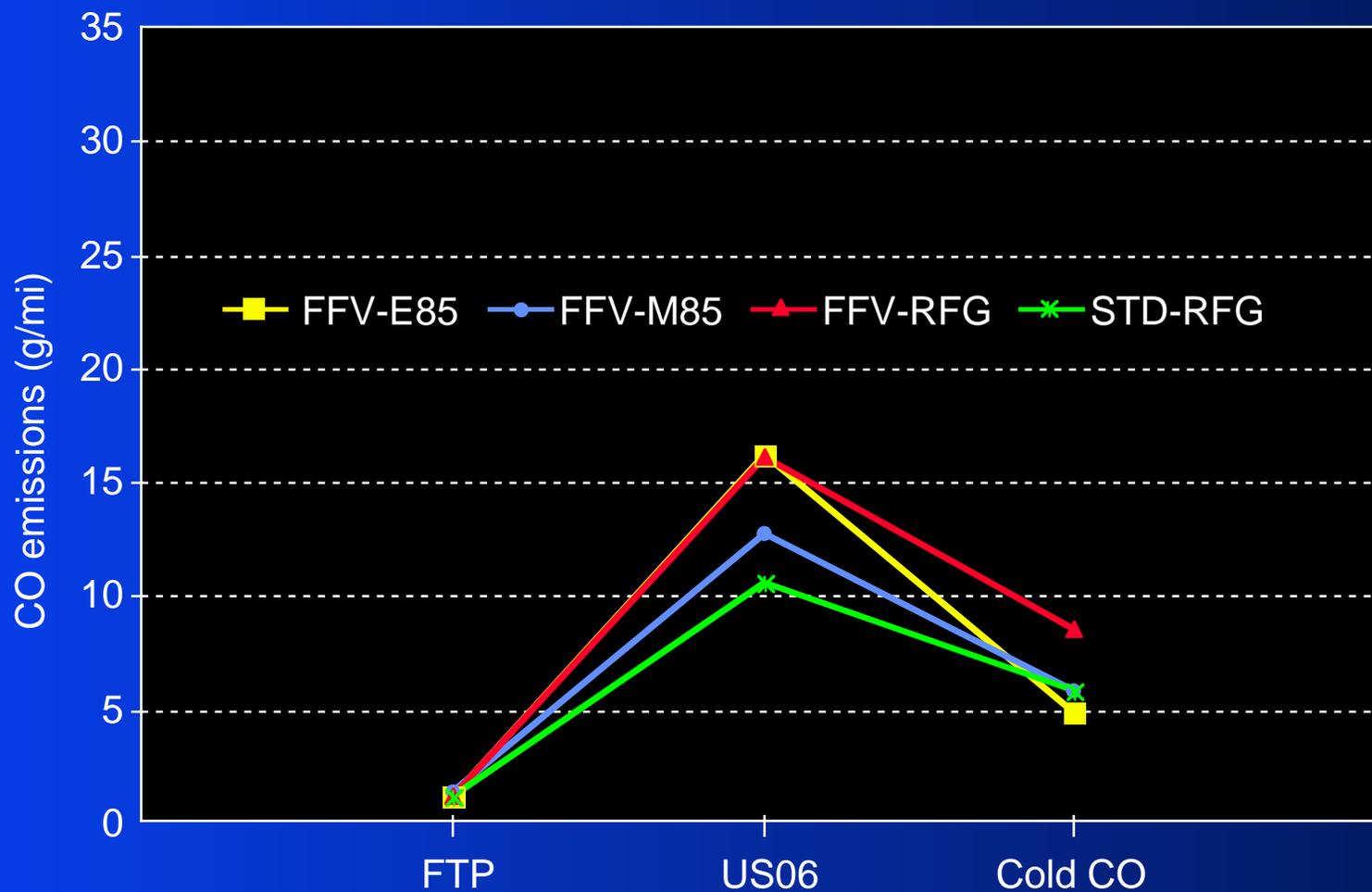
Dodge Intrepid—M85-FFV Cold CO Continuous Emissions



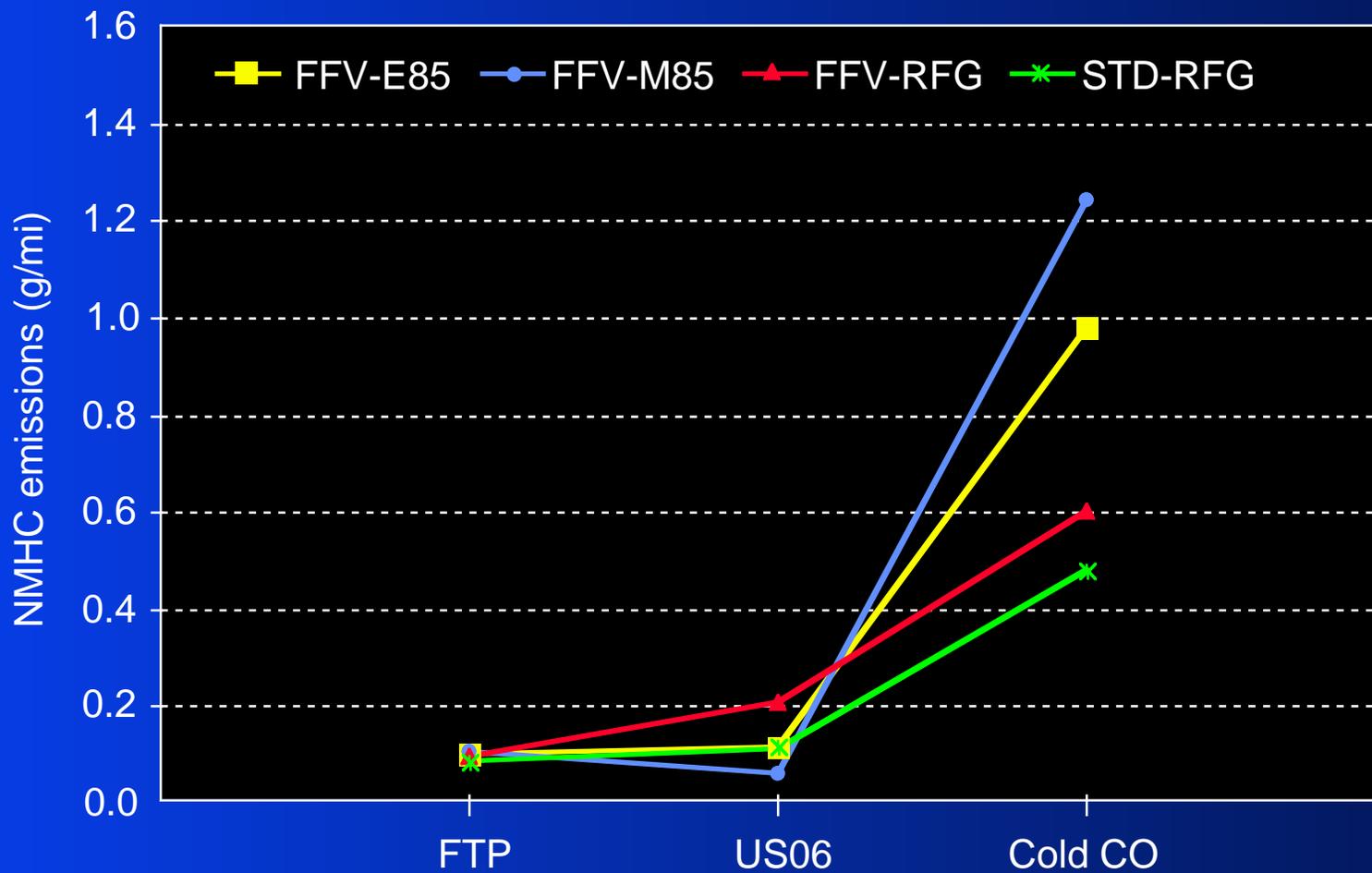
Dodge Intrepid—M85-FFV US06 Continuous Emissions



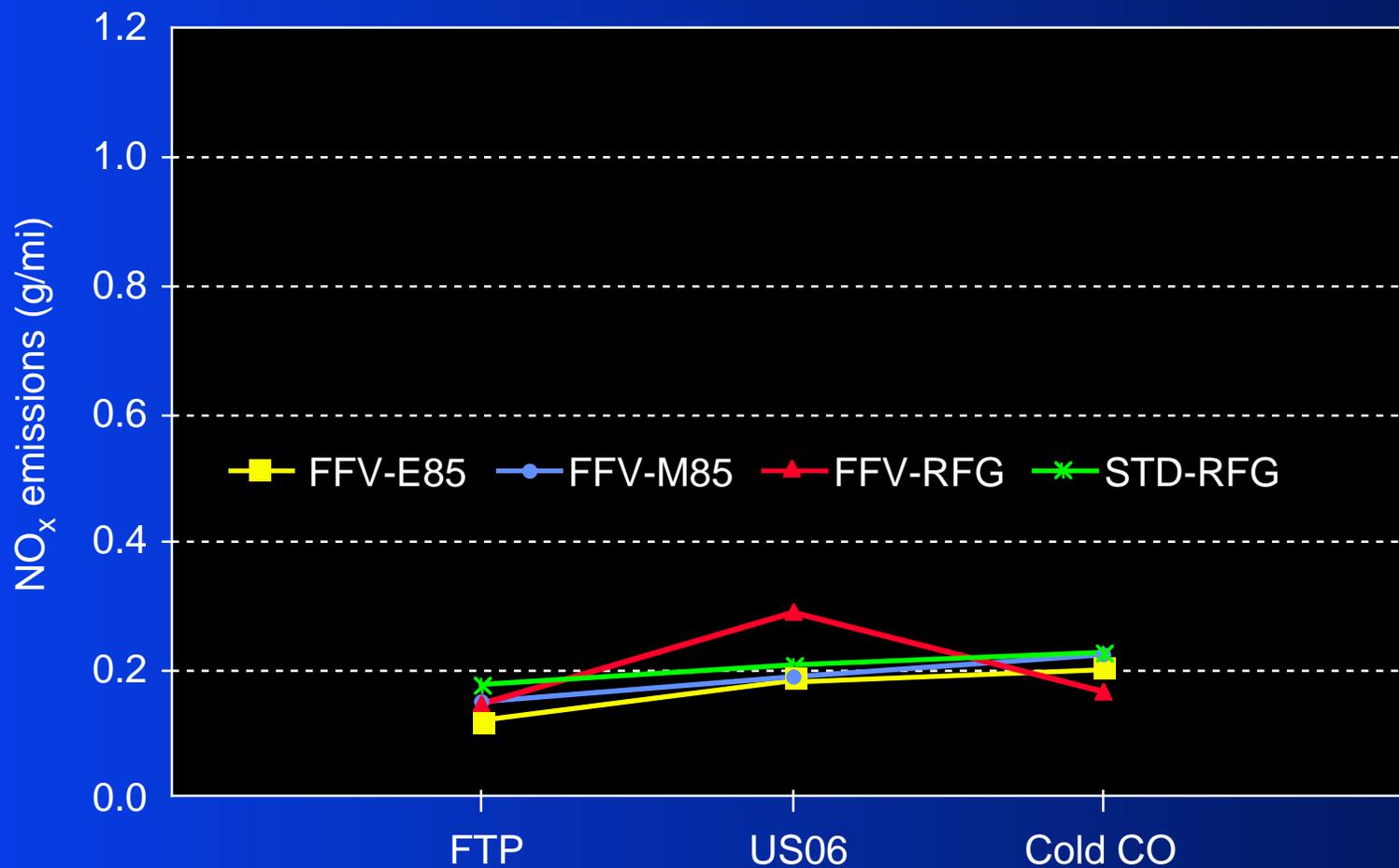
Ford Taurus—Carbon Monoxide



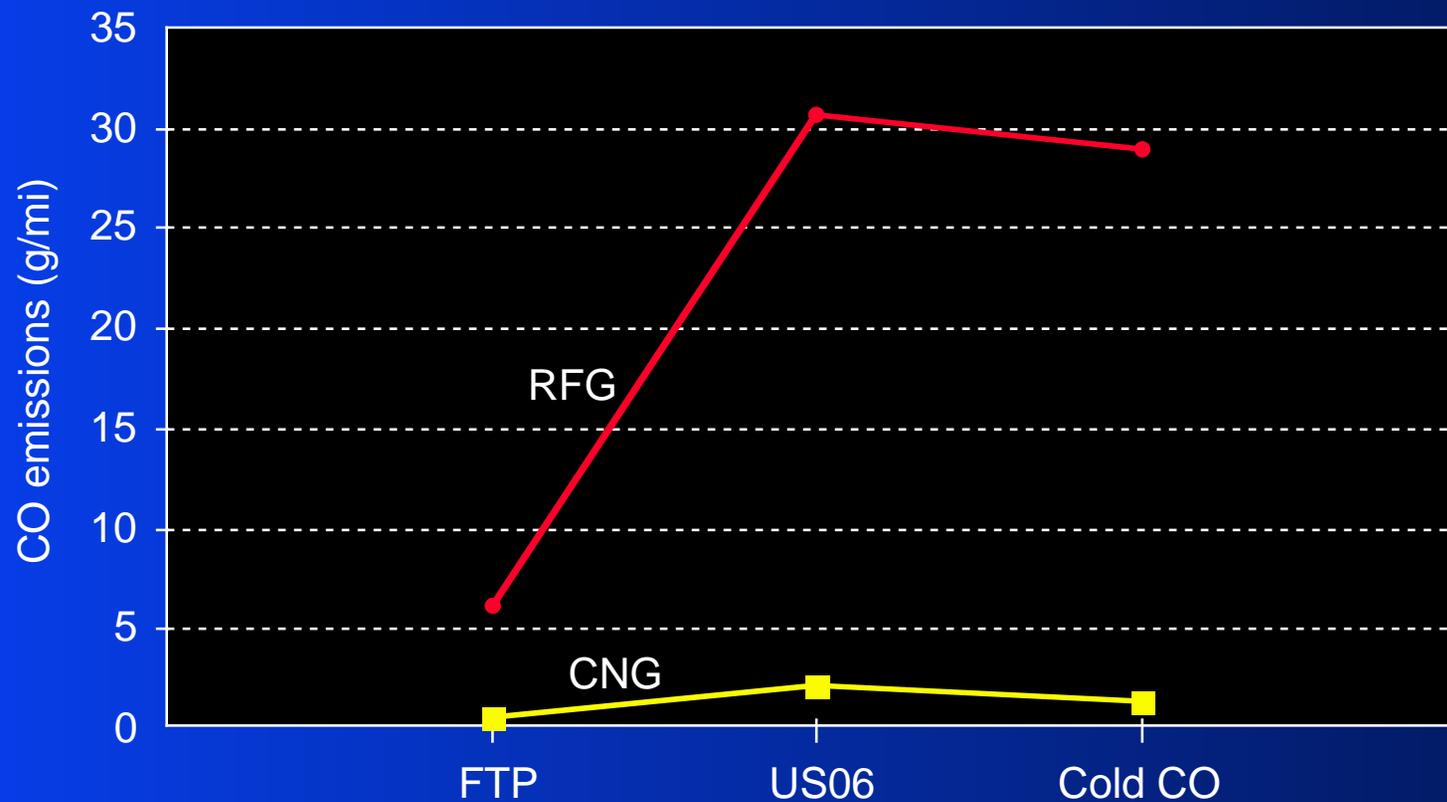
Ford Taurus—Non-Methane Hydrocarbon Equivalent



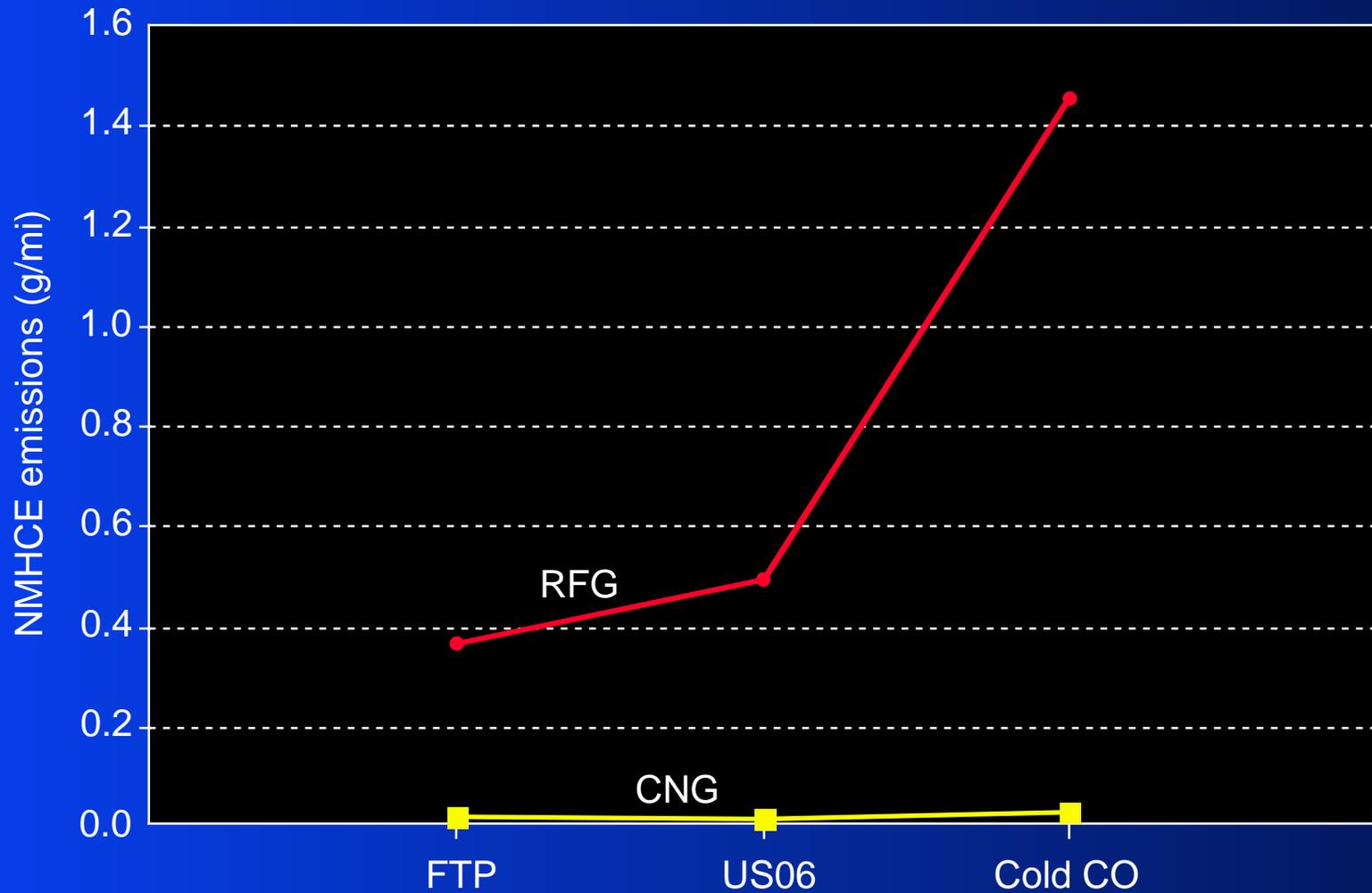
Ford Taurus—Oxides of Nitrogen



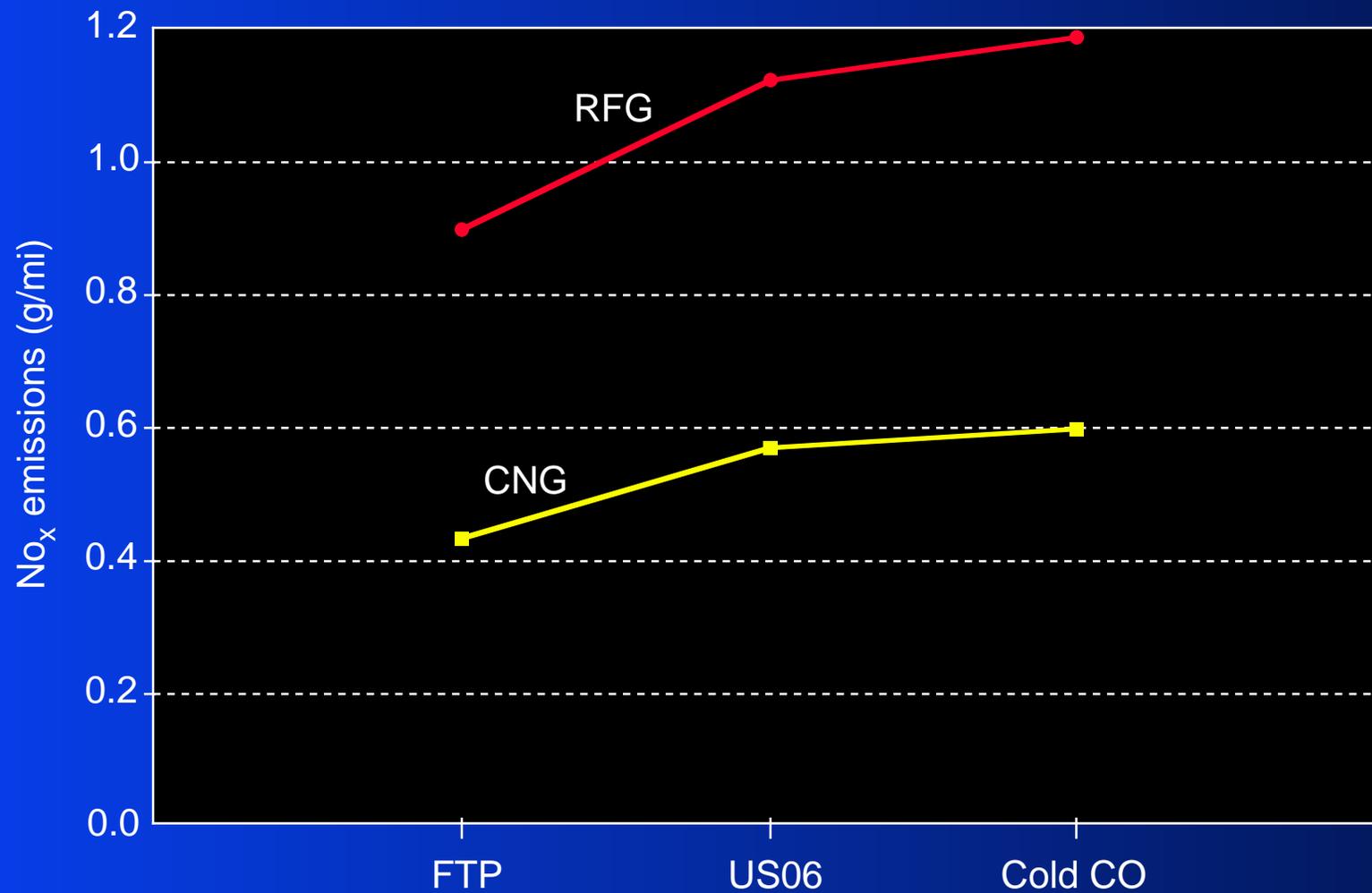
Dodge B250 Van—Carbon Monoxide



Dodge B250 Van—Non-Methane Hydrocarbon Equivalent



Dodge B250 Van—Oxides of Nitrogen





Conclusions

CNG

- OEM dedicated-CNG vehicle resistant to changes in driving cycle (i.e., clear emissions benefits compared to standard gasoline vehicle on all three driving cycles—FTP, US06, and Cold CO)

Alcohol Fuels

- Tended to perform relatively well on US06 driving cycle
 - Reduced NMHC and CO
 - Relative NO_x levels similar to FTP
- Exhibited increased NMHC on Cold CO tests



Program Direction

1997

- Complete testing on first round of detailed study vehicles
 - Bi-fuel QVM Ford F150 Pickups and Ford Contours
- Complete statistical analysis and publication of all results

1998

- Additional detailed study vehicle testing
 - Later model OEM CNG vehicle
 - 2nd round of testing to verify results
 - Addition of particulate matter study to detailed study vehicle program
- High-mileage focus fleet



Acknowledgment

Automotive Testing Laboratories

Wendy Clark and Walt Dudek

*Winner of Small Business Administration's Small
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